CLAIMS

1. Method of manufacturing a container (1; 7; 18; 44) from plastic material, of the type consisting of thermally conditioning (29) at least certain areas (2; 12; 13; 14) of a preform (3; 11; 30) of the container so that the temperature of said areas exceeds the glass transition temperature of their constituent material, and of injecting a fluid into the preform to cause its expansion in order to form it into a container, is characterized in that it consists of performing a free expansion (in 31) , that is, outside of a mold, of at least some of the areas of the preform, and of controlling at least one injection parameter of the fluid in order to produce the final container.

2. Method according to claim 1, characterized in that it consists of controlling at least one injection parameter of the fluid so that the final internal volume of the container falls within predetermined limits with respect to a reference volume.

3. Method according to either of claims 1 or 2, characterized in that it consists of controlling at least one injection parameter of the fluid by taking into account the temperature of said areas of the preform.

4. Method according to any of claims 1 to 3, characterized in that one controlled parameter is the pressure of the fluid injected into the preform.

5. Method according to any of claims 1 to 3, characterized in that one controlled parameter is the flow rate of the fluid injected into the preform.

6. Method according to claim 4, characterized in that the pressure is variable during injection.

7. Method according to claim 6, characterized in that it consists of beginning the injection with a flow rate and/or a pressure that is more than the pressure at the end of injection, and in that the flow rate and/or the pressure and initial fluid flow rate are controlled in order to prevent the constituent material of the preform, thus that of the container, from solidifying before obtaining the desired expansion, and the pressure at the end of injection is reduced to prevent the material from bursting.

8. Method according to any of claims 1 to 3, characterized in that one controlled parameter is the temperature of the fluid.

9. Method according to claim 1, characterized in that it consists of controlling the injection parameters of the fluid so that expansion is stopped naturally by the solidifying of the constituent material of the preform when the expansion becomes significant, so that when the material is solidified the reaction forces exerted by the material are opposite to those exerted by the fluid.

10. Method according to claim 2, characterized in that it consists of controlling the injection parameters of the fluid so that expansion is naturally stopped by solidifying the constituent material of the preform when the expansion is such that the final internal volume of the container falls within predetermined limits with respect to a reference volume, so that when the material is solidified the reaction forces exerted by the material are opposite to those exerted by the fluid.

11. Method according to any of claims 1 to 3, characterized in that it consists of stopping the fluid injection after a predetermined time.

12. Method according to any of claims 1 to 11, characterized in that the fluid is a gas.

13. Method according to claim 12, characterized in that, because the container is intended to be filled by means of a liquid (52) after it is manufactured, it consists:

- of first causing the expansion of the preform;
- then, while maintaining a residual pressure of gas inside the container when it is formed, of immediately filling the container with a liquid under a gas pressure at least equal to the residual pressure in the container.

14. Method according to claim 13, characterized in that it consists in first sealably isolating the interior of the preform from the exterior environment; in placing the interior of the preform in communication with a source of gas (490, 53) for pressurizing the fill liquid, in order to cause the expansion of the preform by means of said source; then, when the expansion is completed, while maintaining the

isolation from the exterior and the communication between the interior of the preform with the source of gas, of causing the filling (584, 585) of the container thus formed with the liquid under pressure.

15. Method according to any of claims 12 to 14, characterized in that the gas is compressed air.

16. Method according to any of claims 1 to 11, characterized in that the fluid is a liquid.

17. Method according to claim 16, characterized in that, because the container is intended to be filled by means of a liquid, it consists of using said liquid to cause the expansion of the preform in order to make it into a container, during the filling phase of the container which thus constitutes its manufacturing phase (figure 6, figure 7).

18. Method according to claim 17, characterized in that the liquid is hot.

19. Method according to any of the preceding claims, characterized in that it consists of introducing a predetermined volume of fluid into a compartment, of placing the compartment in sealed communication with the preform, and of transferring the fluid from the compartment to the preform, while controlling at least one transfer parameter of said fluid outside the compartment to allow the expansion of the preform and its transformation into a container (figure 9, figure 10).

20. Method according to any of the preceding claims, characterized in that, to vary the shape of the containers from one manufacturing to another, it consists of modifying the heating profile of said areas (12; 13; 14) of preforms of containers during their thermal conditioning.

21. Method according to any of the preceding claims, characterized in that it includes the step of producing a base area (17) on the container, in a step consecutive to their formation, by causing pressure (20) between the area of the container at the location where the base area should be produced and an exterior pressing surface.

22. System of manufacturing containers comprising a unit (29) for thermally conditioning at least a preform and an expansion unit (31) with at least an expansion device (36; 361; ...; 368) of the said at least a preform, which expansion devices is associated with a source of fluid (50; 54; 62; 66) to cause the expansion of the preform by injection of said fluid, and it has means for sealably isolating the interior of the preform from the exterior environment, and means (461; ...; 468) for placing the interior of the preform in communication with said source of fluid to cause the expansion of the preform, characterized in that the expansion unit is a free expansion unit of at least certain of said areas of the preform, and that it has a control unit (47) for controlling at least one injection parameter of the fluid in order to control the expansion of the preform produce the final container.

23. System according to claim 22, characterized in that it has the control unit (47) is associated [sic] with means for measuring a temperature of at least one area of the preform, and the means for controlling at least one injection parameter of the fluid are devised so as to effect this control as a function of the result of the temperature measurement of the preform.

24. System according to claim 22, characterized in that the control unit (47) is associated with means for controlling the pressure of the fluid injected into the preform.

25. System according to claim 24, characterized in that the means for controlling the pressure of the fluid injected into the preform are devised to vary the pressure of the fluid during the injection.

26. System according to claim 22, characterized in that the control unit (47) is associated with means for controlling the flow rate of the fluid injected into the preform.

27. System according to claims 22, characterized in that the control unit (47) is associated with means for controlling the temperature of the fluid.

28. System according to claim 22, characterized in that the control unit (47) is associated with means for controlling the duration of injection of the fluid.

29. System according to claim 22, characterized in that, because the container is intended to be filled with a liquid after it is manufactured, and the fluid used for the expansion is a gas (53), it includes means for maintaining a residual pressure of gas inside the container when it is formed, and for immediately filling the container with a liquid under pressure of gas at least equal to the residual pressure in the container.

30. System according to claim 29, characterized in that it includes a tank (51) of pressurized fill liquid, a source of gas (490) for pressurizing the tank, and means (464, 465; 644, 645) for placing the interior of the preform in communication with said source of pressurized gas, in order to cause the expansion of the preform by means of said source, and means, when the expansion is complete, of maintaining isolation from the exterior and communication between the interior of the preform and the source of gas, and causing the filling of the container thus formed.

31. System according to claim 22, characterized in that, because the container is intended to be filled with a liquid from a filling unit, the expansion unit is composed of the filling unit and the control unit (47) is associated with means (49, 697, 698) for controlling the pressure of the fill liquid.

32. System according to claims 22 to 31, characterized in that the source of fluid for causing the expansion is composed of a compartment (61, 614, 615, 617, 618) containing a volume of fluid at least equal to the desired volume for the final container, and a control unit (47) is associated with means (65, 654, 655, 657, 658) for transferring the fluid contained in the compartment to the preform and means for controlling at least one transfer parameter of said fluid outside the compartment in order to allow the final container to have a predetermined volume.

33. System according to claim 22, characterized in that the thermal conditioning unit (29) has means for preselecting the heating profile the profile [sic] of the preform.